

BLACK ROT OF APPLE

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The apple (*Malus sylvestris* Mill.), both wild and cultivated, has been enjoyed by man since prehistoric times. Wild apples were once widespread in the forests of Asia Minor, the Caucasus, Turkey, and Iran, even as far east as the Himalayan region, and the entire Old World (4). Apples were introduced into the New World by early settlers who brought seeds with them from Europe, and the apple tree now grows from Washington state to North Georgia. Further penetration southward had not been previously possible. However, sufficient low-chilling requirement apples (300-400 hours below 45°F) are now available which will produce acceptable apples in subtropical Central Florida (3,7,8). The following cultivars have been found to be climatically adapted to Florida. 'Mayan' (recommended for trial in north Florida), 'Anna' (Florida's most widely planted apple), 'Dorsett Golden' (presently 'Anna's' best pollinator), 'Ein Shemer' (less prolific in bearing and growth habit), 'Elah' (very precocious and prolific), 'Michal' (has resistance to leaf diseases), and 'Schlomit' (3,7,8).

Of the diseases affecting *M. sylvestris*, black rot is considered one of the most important apple diseases in the southeastern United States (10).

SYMPTOMS AND SIGNS: Fruit lesions start as small brown spots, frequently at a wormhole, but darken and turn black as they expand. There is usually one lesion to an apple (Fig. 1), often at the calyx end, with concentric zones of black and brown, containing minute black, carbonaceous pycnidia (Fig. 2). The rot eventually takes in the whole fruit, which shrivels, wrinkles, and finally mummifies (5).

The leaf spot phase of this disease, called frog-eye leaf spot (Fig. 3), is general on apple and crabapple from the Atlantic coast to the Great Plains. It is also widespread on various woody plant species (5). Leaf lesions appear first as small purple specks, then enlarge to about 1/8 to 1/4 inch in diameter. Older lesions have irregular purple margins with alternating bands of light and dark giving the lesions a 'frog-eye' appearance. Later, black pycnidia may develop on the upper leaf surface, near the center of the lesion (6).

On hardwoods, limbs are girdled with large areas of rough bark with numerous protruding black pycnidia (Fig. 4). Perithecia, sometimes formed in cankers or on twigs, have fleshy walls and are sunken in the host tissues with their necks erumpent, but apparently play little part in the life history. The fungus mainly winters as dormant mycelium or in the pycnidial state (1,5).

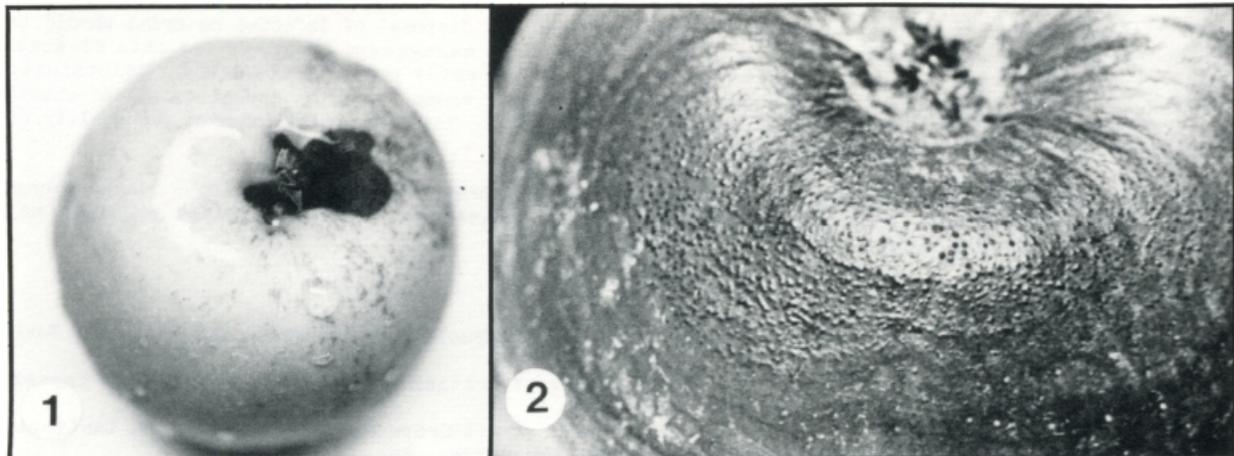


Fig. 1. Black rot of apple (single lesion) from original sepal infection. (Photo courtesy R. W. Miller, Clemson University) Fig. 2. Advanced symptoms of black rot of apple showing concentric zones with minute black carbonaceous pycnidia. (Photo courtesy R. W. Miller, Clemson University)

CAUSAL AGENTS AND HOST RANGE: The pathogen causing black rot is *Sphaeropsis malorum* Pk. (1,2,5), the imperfect state of *Botryosphaeria obtusa* (Schwein) Shoem. [*Physalospora obtusa* (Schwein.) Cooke occurring in the Eastern United States (1,5,9). *Botryosphaeria stevensii* Shoem. [= *Physalospora mutila* (Fr.) N. E. Stevens], the cause of black rot of apple in the West, is similar to *B. obtusa* (5,9). The imperfect state of *B. stevensii* is *Diplodia mutila* (Fr.) Mont. (9).

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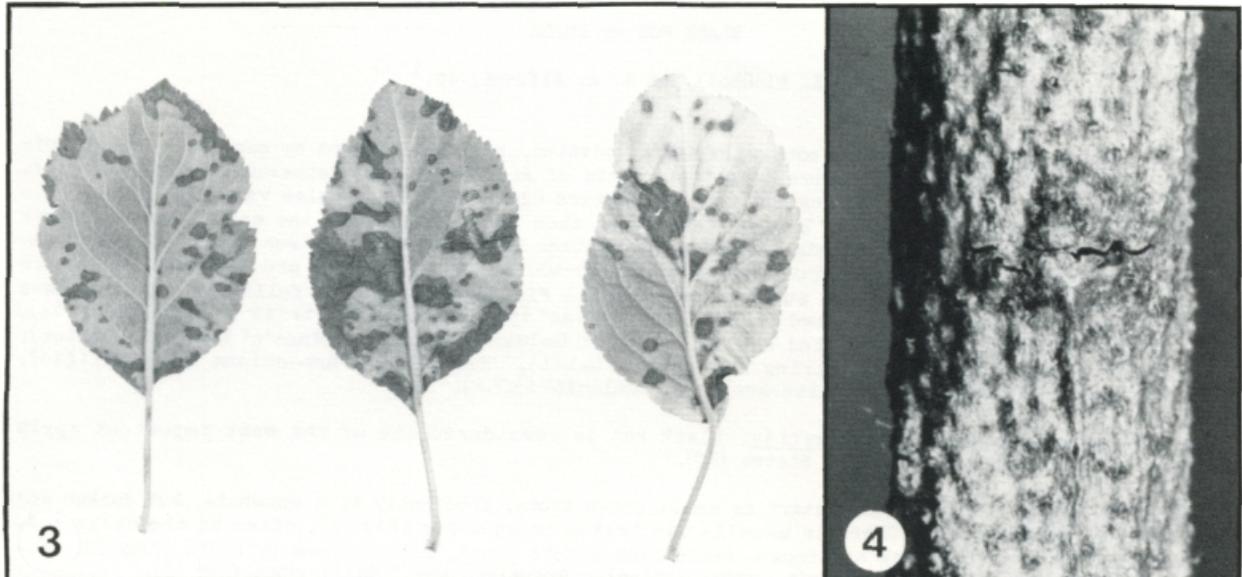


Fig. 3. Frog-eye leaf spots on *Malus sylvestris* 'Dorsett Golden' caused by *Sphaeropsis malorum*. (DPI Photo 11702722-14 by V. Jane Windsor) Fig. 4. Black rot of apple: Pycnidia in stem. (Photo courtesy R. W. Miller, Clemson University)

Sphaeropsis malorum was first reported as causing apple rot in 1879 (5). This fungus is found on many plants, including catalpa, cotoneaster, crabapple, hawthorn, persimmon, and other woody plant species (5).

CONTROL: To protect from infection by spores of the black rot fungus, which are airborne and waterborne (10), the following fungicides which are registered for use on apple may be used: benomyl plus mancozeb or benomyl plus captan. Follow label recommendations. In areas where the disease is common on fruit and leaves, a spray program is required from early pre-pink through harvest (6).

Sanitation can also help control black rot. Careful pruning and disposal of infected material should be an important component of both current-season and long-range management programs for this disease. Prunings should be removed from the orchard and burned by the early pre-pink stage (6). Maintaining trees in good vigor by adequate pruning and fertilization helps trees to resist infection. Trees should be sufficiently open to allow spray and sunlight to penetrate. This will also improve the quality of fruit produced in the center of trees (6).

SURVEY AND DETECTION: Look for concentric zones of black and brown on fruit, and minute black, carbonaceous fruiting structures (pycnidia), and frog-eye spots on leaves. Protruding black pycnidia may also be seen on affected twigs.

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